

**REMARKS**

Upon entry of this Amendment claims 1-35 will be pending, of which claims 1, 22 and 32 are independent.

New claims 33-35 were added to more fully claim the applicants' invention. Support for these claims is found throughout the specification, for example, on page 5, lines 14-24, and examples 1, 4, 5 and 7. Accordingly, no new matter has been introduced by this Amendment.

Claims 1-3 and 31 were rejected under 35 USC § 112, second paragraph for allegedly failing to particularly point out and distinctly claim the present invention, or being indefinite. The Applicants submit that the above amendments to Markush language of claims 1-3 and the removal of "such that" from claim 31 place these claims in full compliance with § 112, second paragraph.

Claim 26 was objected to under 37 CFR 1.75(c) for allegedly failing to provide antecedent basis for the term "esters." Applicants assert that the above amendment, which uses the term "transesterification" places the claim in full compliance with 37 CFR 1.75(c). Support for this amendment is found throughout the specification, for example, on page 6, lines 3-10. Accordingly, no new matter has been introduced.

Claims 5-21, 30 and 31 were objected to under 37 CFR 1.75(c) as being written in improper dependent form. The Applicants submit the present claims, as amended, are fully compliant with 37 CFR 1.75(c).

Finally, the claims were rejected as anticipated under 35 USC § 102(e) over Putzig et al, US 6,066,714. Applicants respectfully traverse this rejection for at least the following reasons.

The Examiner notes that Putzig "discloses a catalyst composition comprising a titanium compound, a phosphorous compound, an amine, a solvent having at least two hydroxyl groups, and a cocatalyst." Paper No. 4, page 3. Nowhere, however, does Putzig describe a **reaction product** of an orthoester or condensed orthoester of at least one metal selected from titanium, zirconium, or aluminum; an alcohol containing at least two hydroxyl groups, and an organophosphorus compound containing at least one P-OH group.

Putzig describes a compound with at least two hydroxyl groups merely as a solvent. For example, at Col. 3, line 64 the author's note "[a]ny solvent that can substantially dissolve the catalyst composition disclosed above can be used in the present invention." Putzig further describes the role of solvent (which may be ethylene glycol) at Col. 5, lines 39-42, noting that "...the phosphorus compound can be combined with a solvent and a titanium compound to form a complex. The complex can be *isolated from the solvent* by any conventional means such as filtration to produce an isolated complex." (emphasis supplied).

Similarly, Putzig's own examples show the use of compounds such as ethylene glycol merely to dissolve a desired compound. In Example 3, for instance, Putzig notes that after the addition of an organophosphorus compound (a mixed butyl phosphate ester) to tetra-isopropyl titanate and subsequent neutralization with 2[2-(dimethylamino)ethoxy]ethanol, "[t]he reaction mass was then diluted with 16.37 gm of ethylene glycol, to give a clear, pale yellow solution...".

Although Putzig mentions a compound with at least two hydroxyl groups for use as a solvent (from which a desired titanium complex could be "isolated from" or "diluted with"), the reference does not describe a reaction product where one such reactant was an alcohol containing at least two hydroxyl groups. Thus, Putzig does not describe all of the elements of the instant claimed embodiment. Nor would the skilled artisan, after reading Putzig, envision a reaction product of a metal orthoester or condensed orthoester, an organophosphorus compound with at least one P-OH group, and an alcohol with at least two hydroxyl groups much less as a catalyst for preparing an ester, because Putzig never describes or suggests such a reaction product.

Accordingly, the Applicants respectfully request reconsideration and withdrawal of this rejection.

In view of the foregoing, the claims are now believed to be in form for allowance, and such action is hereby solicited. If any point remains in issue which the Examiner feels may be best resolved through a personal or telephone interview, please contact the undersigned at the telephone number listed below.

Attached is a marked-up version of the changes made to the specification and claims by the current amendment. The attached Appendix is captioned **"Version with markings to**

**show changes made**".

All objections and rejections having been addressed, it is respectfully submitted that the present application is in a condition for allowance and a Notice to that effect is earnestly solicited.

Respectfully submitted,

PILLSBURY WINTHROP LLP

By: Richard A. Steinberg  
Richard A. Steinberg  
Reg. No. 26,588  
Direct No. (703) 905-2039

Paul L. Sharer  
Reg. No. 36,004  
Direct No. (703) 905-2039

RAS/CMB  
1600 Tysons Boulevard  
McLean, VA 22102  
(703) 905-2000 Telephone  
(703) 905-2500 Facsimile

Attorney Reference: 083255/0284080  
Attachment: Appendix

**APPENDIX: VERSION WITH MARKINGS TO SHOW CHANGES MADE**

**In the Claims:**

1. (Amended) A catalyst composition suitable for use as a catalyst for the preparation of an ester comprising
  - (a) an organometallic compound which is the reaction product of an orthoester or condensed orthoester of at least one metal selected from the group consisting of titanium, zirconium [or aluminium] and aluminum, and an alcohol containing at least two hydroxyl groups, and an organophosphorus compound containing at least one P-OH group, and
  - (b) at least one compound of germanium, antimony or tin.
2. (Amended) A catalyst composition according to claim 1, wherein **[characterised in that]** the organometallic compound comprises the reaction product of an orthoester or condensed orthoester of at least one metal selected from the group consisting of titanium, zirconium [or aluminium] and aluminum, an alcohol containing at least two hydroxyl groups, and an organophosphorus compound containing at least one P-OH group, and a base.
3. (Amended) A catalyst composition according to claim 1, wherein **[or claim 2 characterised in that]** the organometallic compound comprises the reaction product of an orthoester or condensed orthoester of at least one metal selected from the group consisting of titanium, zirconium [or aluminium] and aluminum, an alcohol containing at least two hydroxyl groups, an organophosphorus compound containing at least one P-OH group, a base and a 2-hydroxy carboxylic acid.
4. (Amended) A catalyst composition according to claim 3, wherein **[characterised in that]** the 2-hydroxy acid is lactic acid, citric acid, malic acid or tartaric acid or a phosphorus derivative of at least one of said acids.

5. (Amended) A catalyst composition according to **[any one of the preceding claims characterised in that] claim 1, wherein** the orthoester has the formula  $M(OR)_4$  and/or  $Al(OR)_3$  wherein M is titanium and/or zirconium and R is an alkyl group containing from 1 to 6 carbon atoms.
6. (Amended) A catalyst composition according to **[any one of claims 1, 2 and 3 characterised in that] claim 1, wherein** the condensed orthoester has a structure which can be represented by the formula,  $[R^1O[M(OR^1)_2O]R_n]^1$   $R^1O[M(OR^1)_2O]R_n^1$  where M is titanium and/or zirconium,  $R^1$  is an alkyl group containing 1 to 6 carbon atoms and n is less than 20.
7. (Amended) A catalyst composition according to **[any one of the preceding claims characterised in that] claim 1, wherein** the alcohol containing at least two hydroxyl groups is 1,2-ethanediol, 1,2-propanediol, 1,3-propanediol, 1,4-butanediol, 2-methyl-2,4-pentanediol, diethylene glycol, polyethylene glycol, glycerol, trimethylolpropane, pentaerythritol or 1,6 cyclohexane dimethanol.
8. (Amended) A catalyst composition according to **[any one of the preceding claims characterised in that] claim 1, wherein** the organometallic compound is prepared by reacting a dihydric alcohol with an orthoester or condensed orthoester in a ratio of from 1 to 32 moles of dihydric alcohol to each mole of titanium, zirconium or **[aluminium] aluminum**.
9. (Amended) A catalyst composition according to **[any one of the preceding claims characterised in that] claim 1, wherein** the organophosphorus compound is a phosphate, a pyrophosphate, a phosphonate, a phosphinate, a phosphite or a salt of a phosphate or phosphonate or a phosphorous derivative of a hydroxy acid.[.]
10. (Amended) A catalyst composition according to **[any one of the preceding claims characterised in that] claim 9, wherein** the organophosphorous compound is a substituted or unsubstituted alkyl phosphate, a substituted or unsubstituted aryl phosphate, a salt of an alkyl

or aryl phosphonate, a phosphate of an alkylaryl glycol ether or an alkyl glycol ether, or a product obtainable by reaction of phosphorus pentoxide with a polyhydric alcohol.

11. (Amended) A catalyst composition according to **[any one of the preceding claims characterised in that] claim 10, wherein** the organophosphorus compound is an alkyl phosphate in which the organic group contains up to 20 carbon atoms.

12. (Amended) A catalyst composition according to **[any one of claims 1 to 10 characterised in that] claim 10, wherein** the organophosphorus compound is a phosphate of an alkylaryl glycol ether or an alkyl glycol ether having a carbon chain length up to 18 carbon atoms.

13. (Amended) A catalyst composition according to **[any one of claims 1 to 10 characterised in that] claim 10, wherein** the organophosphorus compound is a reaction product of phosphorus pentoxide and a polyhydric alcohol in which the molar ratio of polyhydric alcohol to P is up to 50:1.

14. (Amended) A catalyst composition according to **[any one of claims 1 to 10 characterised in that] claim 9, wherein** the organophosphorus compound is a phosphorous derivative of a hydroxy acid.

15. (Amended) A catalyst composition according to **[any one of the preceding claims characterised in that] claim 1, wherein** the organophosphorus compound is present in the organometallic compound in an amount in the range 0.1 to 4.0 mole of phosphorus to 1 mole of titanium, zirconium or **[aluminium]** aluminum.

16. (Amended) A catalyst composition according to **[any one of the preceding claims characterised in that] claim 1, wherein** a base is present in the organometallic compound in an amount in the range 0.01 to 4.0 mole of base to 1 mole of titanium, zirconium or

**[aluminium]** aluminum.

17. (Amended) A catalyst composition according to **[any one of claims 3 to 16 characterised in that]** claim 3, wherein the 2-hydroxy acid is present in the organometallic compound in an amount in the range 0.1 to 4 mole acid to 1 mole of titanium, zirconium or **[aluminium]** aluminum.

18. (Amended) A catalyst composition according to **[any one of the preceding claims characterised in that]** claim 1, wherein the compound of germanium is germanium dioxide or a salt of germanium.

19. (Amended) A catalyst composition according to **[any one of the preceding claims characterised in that]** claim 1, wherein the compound of antimony is antimony trioxide or a salt of antimony.

20. (Amended) A catalyst composition according to **[any one of the preceding claims characterised in that]** claim 1, wherein the compound of tin is a tin salt, a dialkyl tin oxide, a dialkyl tin dialkanoate or an alkylstannoic acid.

21. (Amended) A catalyst composition according to **[any one of the preceding claims characterised in that]** claim 1, wherein the molar ratio of the organometallic compound to the compound of germanium, antimony or tin is in the range 9:1 to 1:9 calculated as moles of Ti, Zr or Al to moles of Ge, Sb or Sn.

23. (Amended) A process according to claim 22, wherein **[characterised in that]** the esterification reaction comprises reaction of an alcohol with stearic acid, isostearic acid, capric acid, caproic acid, palmitic acid, oleic acid, palmitoleic acid, triacontanoic acid, benzoic acid, methyl benzoic acid, salicylic acid, a rosin acid, abietic acid, phthalic acid, isophthalic acid, terephthalic acid, sebacic acid, adipic acid, azelaic acid, succinic acid, fumaric acid, maleic acid, naphthalene dicarboxylic acid, pamoic acid, trimellitic acid, citric

acid, trimesic acid or pyromellitic acid.

24. (Amended) A process according to claim 22, wherein **[characterised in that]** the esterification reaction comprises a reaction of an alcohol with an anhydride of a dicarboxylic acid or a tricarboxylic acid.

25. (Amended) A process according to claim 22, wherein **[characterised in that]** the esterification reaction comprises reaction of a methyl ester, an ethyl ester or a propyl ester of acrylic acid or methacrylic acid with an alcohol.

26. (Amended) A process according to claim 22, wherein **[characterised in that]** the esterification reaction comprises **[reaction of two esters to produce two different esters by exchange of alkoxy groups]** a transesterification reaction.

27. (Amended) A process according to claim 22, wherein **[characterised in that]** the esterification reaction comprises a polyesterification comprising the reaction of terephthalic acid, dimethyl terephthalate, dimethyl naphthalenate or naphthalene dicarboxylic acid with 1,2-ethanediol, 1,4-butanediol, 1,3-propanediol, 1,6 cyclohexane dimethanol, trimethylolpropane or pentaerythritol.

28. (Amended) A process according to **[any one of claims 22 to 26 characterised in that]** claim 22, wherein the catalyst is present in an amount in the range 10 to 1200 parts per million calculated as parts by weight of total metal (Ti, Zr or Al plus Ge, Sb or Sn) with respect to weight of product ester.

29. (Amended) A process according to claim 22 or 27, wherein **[characterised in that]** the esterification reaction is a polyesterification and the catalyst is present in an amount in the range 5 to 550 parts per million calculated as parts by weight total metal (Ti, Zr or Al plus Ge, Sb or Sn) with respect to weight of product polyester.



30. (Amended) A process according to **[any one of claims 22 to 26 and 28 characterised in that] claim 22, wherein [the catalyst composition is present in an amount such that]** the total amount of titanium, zirconium or **[aluminium]** aluminum present is in the range 5 to 500 parts per million calculated as parts by weight of Ti, Zr or Al with respect to weight of product ester and the total amount of germanium, antimony or tin present is in the range 5 to 700 ppm calculated as Ge, Sb or Sn with respect to product ester.

31. (Amended) A process according to **[any one of claims 22, 27 or 29 characterised in that] claim 22, wherein [the catalyst composition is present in an amount such that]** the total amount of titanium, zirconium or **[aluminium]** aluminum present is in the range 3 to 250 parts per million calculated as parts by weight of Ti, Zr or Al with respect to weight of product polyester and the total amount of germanium, antimony or tin present is in the range 3 to 300 ppm calculated as Ge, Sb or Sn with respect to product polyester.

*End of Appendix*